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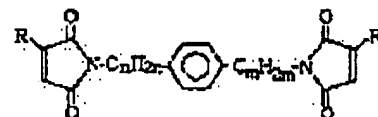
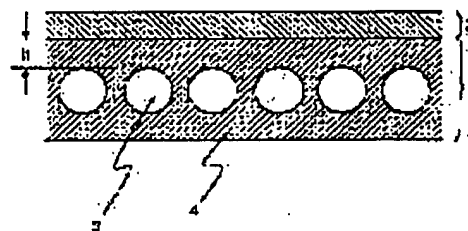
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## (54) TIRE REINFORCING LAMINATED MEMBER AND PNEUMATIC TIRE APPLYING IT

## (57)Abstract:

**PROBLEM TO BE SOLVED:** To improve anti-fatigue property of rubber by laminating squeegee rubber on a cord layer formed by steel cord buried in coating rubber, holding an elastic rate between the squeegee rubber and the coating rubber within a specific relationship and composing a specific compound to the squeegee rubber.

**SOLUTION:** In the tire reinforcing laminated member of a pneumatic tire, squeegee rubber 2 of a rubber compound A is pasted on a cord layer 1 in which steel cords 3 are buried in the coating rubber 4 of a rubber compound B, but rubber material capable of sulfur vulcanization is used for a rubber component in the rubber compound A of the squeegee rubber 2 and in the rubber compound B of a coating rubber 4. And in this case, the elasticity a of the rubber compound A and the elasticity b of the rubber compound B are so set as to satisfy a relationship  $b \geq a$ , meanwhile the rubber compound A is made to include such a compound is displayed by a separately shown general equation so as to improve the fatigue resistance of the squeegee rubber 2. In the equation, R, R' stand for low grade alkyl group, n, m stand for integers 1 to 5.



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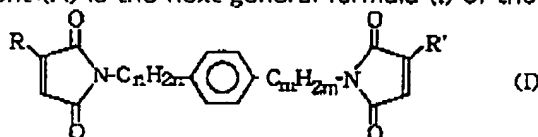
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## CLAIMS

## [Claim(s)]

[Claim 1] In the laminating member for tire reinforcement which comes to carry out the laminating of the squeegee rubber on the code layer in which it comes to lay a steel code under the coating rubber The rubber component in the rubber constituent (A) of said squeegee rubber and the rubber constituent (B) of said coating rubber consists of rubber in which sulfur vulcanization is possible. The elastic modulus a of said rubber constituent (A) and the elastic modulus b of said rubber constituent (B) satisfy the relation of a degree type and  $b \geq a$ , and said rubber constituent (A) is the next general formula (I) of the 0.1 - 1.2 weight section to the rubber



comp nent 100 weight section,

It is the laminating member for tire reinforcement characterized by containing the compound expressed with (R and R' in a formula shows a low-grade alkyl group, and n and m show the integer of 1-5, respectively).

[Claim 2] The laminating member for tire reinforcement according to claim 1 in which said rubber constituent (A) and said rubber constituent (B) contain the sulfur of 1 - 10 weight section to the rubber component 100 weight section.

[Claim 3] The radial-ply tire containing air characterized by the laminating member for tire reinforcement according to claim 1 or 2 boiling all as radial carcass ply of one or more layers of the radial-ply tire containing air, or coming to be applied to a part.

[Claim 4] The radial-ply tire containing air characterized by the laminating member for tire reinforcement according to claim 1 or 2 boiling all as a belt of one or more layers of the radial-ply tire containing air, or coming to be applied to a part.

[Claim 5] The bias tire containing air characterized by the laminating member for tire reinforcement according to claim 1 or 2 boiling all as a breaker of one or more layers of the bias tire containing air, or coming to be applied to a part.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention on the code layer in which it comes to lay a steel code under the coating rubber It is related with the pneumatic tire which applied the laminating member for tire reinforcement and it to which it comes to carry out the laminating of the squeegee rubber. In detail The fatigue resistance of a rubber constituent is raised sharply, without spoiling the initial adhesive property between a steel code and coating rubber, and a heatproof and moisture resistant glueability, and it is related with the pneumatic tire which applied the laminating member for tire reinforcement and it which can raise the endurance of a pneumatic tire sharply.

[0002]

[Description of the Prior Art] As for the pneumatic tire, the code layer in which it comes to lay a steel code under the coating rubber is applied to carcass ply, the belt, or the breaker as the reinforcement member. Moreover, raising the fatigue endurance of a code layer and raising the endurance of a pneumatic tire is also well made by carrying out the laminating of the squeegee rubber between plies.

[0003] In the pneumatic tire reinforced with this laminating member for tire reinforcement, making it compatible [ with the high level ] about the following two points is required. One of them is the endurance of the heat generated by transit or distortion, and code coating rubber [ as opposed to the heat under high humidity by the case ]. Another is securing the adhesion endurance between a code and coating rubber. Moreover, it is adhesive (an "initial adhesive property" is called below) improvement between the code in rationalization of a production process, and the field of energy saving to short-time vulcanization, and coating rubber.

[0004]

[Problem(s) to be Solved by the Invention] However, the present condition is that reconciling two above-mentioned demand characteristics with the high level is not yet made. For example, in the rubber constituent using the cobalt compound as an adhesion promoter of a steel code and rubber, although the initial adhesive property which surely was excellent is acquired, the endurance of this rubber constituent will compare with cobalt compound a non-added thing, and will be remarkably inferior.

[0005] Then, the purpose of this invention is by applying the laminating member for tire reinforcement and it by which the fatigue resistance of rubber has been improved to offer the pneumatic tire which improved sharply [ endurance ], without spoiling the initial adhesive property between a steel code and coating rubber, and a heatproof and moisture resistant glueability.

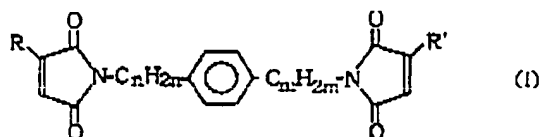
[0006]

[Means for Solving the Problem] As a result of inquiring wholeheartedly that the above-mentioned technical problem should be solved, this invention person does the laminating of the squeegee rubber on the code layer in which it comes to lay a steel code under the coating rubber, and came to complete a header and this invention for the ability of the above-mentioned technical problem to be solved by maintaining the modulus of elasticity of this squeegee rubber and coating rubber in a predetermined relation, and blending a specific compound with squeegee rubber.

[0007] That is, this invention is as follows, respectively.

(1) In the laminating member for tire reinforcement which comes to carry out the laminating of the squeegee rubber on the code layer in which it comes to lay a steel code under the coating rubber The rubber component in the rubber constituent (A) of said squeegee rubber and the rubber constituent (B) of said coating rubber consists of rubber in which sulfur vulcanization is possible. The elastic modulus a of said rubber constituent (A) and the elastic modulus b of said rubber constituent (B) satisfy the relation of a degree type and  $b \geq a$ , and said rubber constituent (A) is the next general formula (I) of the 0.1 - 1.2 weight section to the rubber component 100

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weight section,

It is the laminating member for tire reinforcement characterized by containing the compound expressed with (R and R' in a formula shows a low-grade alkyl group, and n and m show the integer of 1-5, respectively).

[0008] (2) In the laminating member for tire reinforcement of the above (1), it is the laminating member for tire reinforcement in which said rubber constituent (A) and said rubber constituent (B) contain the sulfur of 1 - 10 weight section to the rubber component 100 weight section.

[0009] (3) It is the radial-ply tire containing air characterized by the above (1) or the laminating member for tire reinforcement of (2) boiling all as radial carcass ply of one or more layers of the radial-ply tire containing air, or coming to be applied to a part.

[0010] (4) It is the radial-ply tire containing air characterized by the above (1) or the laminating member for tire reinforcement of (2) boiling all as a belt of one or more layers of the radial-ply tire containing air, or coming to be applied to a part.

[0011] (5) It is the bias tire containing air characterized by the above (1) or the laminating member for tire reinforcement of (2) boiling all as a breaker of one or more layers of the bias tire containing air, or coming to be applied to a part.

[0012]

[Embodiment of the Invention] As the laminating member for tire reinforcement of this invention is shown in drawing 1, it comes to stick the squeegee rubber 2 of a rubber constituent (A) on the code layer 1 which the steel code 3 is laid under the coating rubber 4 of a rubber constituent (B), and becomes it.

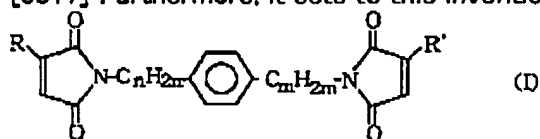
[0013] Although the thickness of this squeegee rubber 2 cannot be suitably selected according to the application part of a tire and should not be restricted especially, it is 0.1-10mm preferably.

[0014] Moreover, with the application part of a tire, and the code kind to be used, required values differ and thickness h of the coating rubber 4 on the steel code 3 in the code layer 1 should not be restricted especially, either.

[0015] In this invention, the rubber component in the rubber constituent (A) of said squeegee rubber and the rubber constituent (B) of said coating rubber consists of rubber material in which sulfur vulcanization is possible, especially, natural rubber, polyisoprene rubber, polybutadiene rubber, styrene butadiene copolymer rubber, or such mixture have high \*\*\*\*\*, and it is suitable for them.

[0016] Moreover, in this invention, it requires that the elastic modulus a of said rubber constituent (A) and the elastic modulus b of said rubber constituent (B) satisfy the relation of a degree type and  $b \geq a$ . This is based on the following reasons. By using organic-acid cobalt salt etc., when making it the moduli of elasticity a and b of said rubber constituent (A) and (B) fill the relation of said formula, distortion of coating rubber distributes, and the input of endurance of the coating rubber which had become a problem in the former to coating rubber weakens and improves compared with structure conventionally. By this, organic-acid cobalt salt etc. can be used for the rubber constituent (B) of coating rubber, and the initial adhesive property between steel code-coating rubber can be maintained on a par with the former, and adhesion endurance can also be maintained on a par with the former.

[0017] Furthermore, it sets to this invention and said rubber constituent (A) is the following general formula (I).



By coming out, and containing the compound expressed and not containing a cobalt metal salt, it can compare with coating rubber and the fatigue endurance of squeegee rubber can be raised sharply. The fatigue input to the coating rubber of a rubber constituent (B) decreases further by this, and the endurance of a tire improves as a result. the rubber component 100 weight section from viewpoints, such as effectiveness as opposed to this fatigue endurance in the loadings, and workability, -- receiving -- the 0.1 - 1.2 weight section -- it considers as the 0.3 - 0.7 weight section preferably. They are N and N'-meta xylene-screw-citraconic-acid imid especially preferably among said compounds (I). In addition, in this invention, said compound (I) can be blended within limits which can maintain relation with an elastic modulus with said rubber constituent (A) at the relation of said 1/4

formula also about said rubber constituent (B).

[0018] In this invention, it is desirable that said rubber constituent (A) and said rubber constituent (B) contain the sulfur of 1 - 10 weight section to the rubber component 100 weight section further again. The elastic modulus for which this reason is needed as a product under in 1 weight section is not obtained. In adhesion endurance with a steel code, it becomes inadequate at coincidence. On the other hand, if 10 weight sections are exceeded, the heat-resistant aging nature of rubber falls remarkably, and it is not desirable.

[0019] In addition, in this invention, the various compounding agents other than said compound can be blended with said rubber constituent (A) and (B) if needed, and compounding agents used in the usual rubber industry, such as softeners, such as reinforcing agents, such as carbon black, a silica, and a calcium carbonate, and a bulking agent, aroma oil, can be suitably blended with them within the limits of the usual loadings as this compounding agent if needed.

[0020] Next, in the radial-ply tire containing air of this invention, said laminating member for tire reinforcement boils all as radial carcass ply of one or more (usually one layer) layers, or it comes to be applied to a part. When applying to a part, it is good to apply one or more layers of said laminating member for tire reinforcement to the field which distortion may generate.

[0021] Moreover, in the radial-ply tire containing air of this invention, said laminating member for tire reinforcement boils all as a belt of one or more layers, or it comes to be applied to a part. In applying to a part, in a distortion region, it applies like the case of above-mentioned carcass ply.

[0022] Furthermore, also in the bias tire containing air of this invention, when said laminating member for tire reinforcement boils all as a breaker of one or more layers, or it comes to apply it to a part and it applies to a part also in this case, in a distortion region, it applies like the case of an above-mentioned radial-ply tire.

[0023]

[Example] Next, an example and the example of a comparison explain this invention concretely.

Examples 1-3, the example 1 of a comparison - the 4 natural-rubber 100 weight section, the HAF carbon black 50 weight section, The N-(1, 3-dimethyl butyl)-N'-phenyl-p-phenylene diamine 1 weight section, The compound and organic-acid cobalt salt which are shown in the further following table 1 were blended with the contents of combination of the zinc white 8 weight section, the N-oxy-diethylene-2-benzothiazole sulfenamide 1.0 weight section, and the sulfur 5 weight section, and said rubber constituent (A) and the various rubber constituents for (B) were prepared.

[0024]

[Table 1]

配合剤	ゴム組成物 (重量部)				
	イ	ロ	ハ	ニ	ホ
化合物 A <sup>1)</sup>	0	0.5	0	0.5	0
化合物 B <sup>2)</sup>	0	0	0	0	0.5
ナフテン酸コバルト	0	0	0.15	0.15	0
弾性率 (指数) <sup>3)</sup>	100	104	110	110	112

1) N and N'-meta xylene-screw-citraconic-acid imide (compound concerning this invention)

2) N and N'-m-phenylene-screw-citraconic-acid imide (comparison compound)

3) JIS According to K6301 tension-test method, the tension test of a dumbbell-like sample was performed, and the elastic modulus at the time of 100% expanding was indicated by the characteristic, having used rubber constituent I as 100.

[0025] The steel code in which the obtained rubber constituent was given to brass plating on the front face as coating rubber for rubber constituents (B) was laid underground, it considered as the code layer, and each evaluation which casts as the rubber constituent similarly obtained is stuck as squeegee rubber for rubber constituents (A) on it and it is shown in drawing 1, and is shown in the following after the vulcanization for [ 145 degree-Cx ] 30 minutes was performed. Here, thickness h of the coating rubber 4 on the steel code 3 in the code layer 1 which shows the thickness of squeegee rubber to 2mm and drawing 1, could be 0.2mm.

[0026] (Initial adhesive property) It is JIS about said production sample. According to the friction test method of K6301, the friction test between a steel code and a laying-under-the-ground rubber layer was performed, and

the rubber coating weight which remained on the code estimated the initial adhesive property. The code displayed as 0 100 and the condition that rubber had not adhered at all for the condition of being completely covered with rubber.

[0027] (Heat-resistant adhesive property) After leaving the same test sample as what was used for the initial adhesion test for seven days in a 100-degree C thermostat, the adhesive property as well as an initial adhesive property was evaluated.

[0028] (Endurance) With the application of said laminating member for prototype rubber reinforcement, the radial-ply tire containing air of size 1800R33 was manufactured to the radial carcass ply (one layer) of six counts / 1 inch width of face, and the durability test at the time of a heavy load pile was performed using this radial-ply tire. This trial evaluated endurance by stepping up the load every 24 hours in the rectilinear-propagation drum test of internal pressure 7 kgf/cm<sup>2</sup> and constant speed 25 kg/h. The result expressed time amount until a tire breaks down with the characteristic, and set the tire (example 1 of a comparison) of structure to 100 conventionally. A result is so good that a numeric value becomes size. A \*\*\*\*\* result is shown in the following table 2.

[0029]

[Table 2]

	実施 例1	比較 例1	比較 例2	実施 例2	比較 例3	実施 例3	比較 例4
ゴム組成物 (A)	ロ	ハ	イ	ニ	ホ	ニ	ホ
ゴム組成物 (B)	ハ	ハ	ハ	ハ	ハ	ニ	ホ
初期接着性 (指数)	100	100	80	100	70	100	10
耐熱接着性 (指数)	120	100	100	100	80	100	70
耐久性 (指数)	150	100	100	120	90	130	40

[0030] examples 4-6 and the examples 5-8 of a comparison — with the application of said laminating member for prototype rubber reinforcement, the radial-ply tire containing air of size 1800R33 was manufactured to all the belts of 10.5 counts / 1 inch width of face, and the same durability test as the above was performed using this radial-ply tire. In this case, two or more laminatings of the basic laminating member which comes to carry out the laminating of the squeegee rubber which becomes the code layer which it comes to lay under the coating rubber constituent (B) from a rubber constituent (A) about a steel code are carried out by the relation which a rubber constituent (A) and a rubber constituent (B) adjoin mutually, and the belt is formed. The result expressed time amount until a tire breaks down with the characteristic, and set the tire (example 5 of a comparison) of structure to 100 conventionally. A result is so good that a numeric value becomes size. A \*\*\*\*\* result is shown in the following table 3.

[0031]

[Table 3]

	実施 例4	比較 例5	比較 例6	実施 例5	比較 例7	実施 例6	比較 例8
ゴム組成物 (A)	ロ	ハ	イ	ニ	ホ	ニ	ホ
ゴム組成物 (B)	ハ	ハ	ハ	ハ	ハ	ニ	ホ
耐久性 (指数)	150	80	100	120	70	110	40

[0032]

[Effect of the Invention] As explained above, it sets to the laminating member for tire reinforcement of this invention. The laminating of the squeegee rubber is carried out on the code layer in which it comes to lay a steel code under the coating rubber. By having maintained the modulus of elasticity of this squeegee rubber and coating rubber in a predetermined relation, and having blended the specific compound with squeegee rubber at least The fatigue resistance of coating rubber can be improved without spoiling the initial adhesive property between a steel code and coating rubber, and a heatproof and moisture resistant glueability. Therefore, the

endurance of a tire can be sharply raised by applying this laminating member for tire reinforcement to the radial carcass ply, belt, or breaker of a pneumatic tire.

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